Geophysical Research Abstracts
Vol. 12, EGU2010-9551, 2010
EGU General Assembly 2010

Examples of using long tem memory in climate analysis

Hans von Storch (1,2) and Eduardo Zorita (1)

(1) GKSS Research Center, Institute for Coastal Research, Geesthacht, Germany (hvonstorch@web.de, 0049 4152 8741831),
(2) CLISAP Center of Excellence, Hamburg University, Hamburg, Germany

Traditionally, the standard assumption about atmospheric (and oceanic) variability (apart of tides) is that of "short memory" – which may be described by an autoregressive process of order n. Often n just set to 1. The motivation is that the considered dynamics may often be approximated by a differential equation of order n, driven by an unexplained part which may be parameterized as white noise (plus external factors). The result is a red spectrum, which is actually found to be a good description of climate spectra.
In recent years, the somewhat more complex concept of long term memory processes has been employed. This application of this concept results in broader distributions and slower decays of autocorrelation functions – therefore "long memory".
We review a number of studies dealing with long memory. First centennial and millennial simulations, with and without external forcing factors, are examined if the generated time series are consistent with long-memory behaviour. It turns out that they are, in particular when external forcing is present. Second, the evidence for non-internal causes for the current multi-decadal warming and clustering of warmest years is found to not being compromised by the assumption of short term variability. Also under long term memory external factors are needed to explain both, the warming and the clustering.
1. Rybski, D., A. Bunde and H. von Storch, 2008: Long-term memory in 1000 years simulated temperature records. J. Geophys. Res. 113, D02106, doi:10.1029/2007JD008568
2. Rybski, D., A. Bunde, S. Havlin,and H. von Storch, 2006: Long-term persistence in climate and the detection problem. Geophys. Res. Lett. 33, L06718, doi:10.1029/2005GL025591
3. Zorita, E., T. Stocker and H. von Storch, 2008: How unusual is the recent series of warm years? Geophys. Res. Lett. 35, L24706, doi:10.1029/2008GL036228